

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of separating species signals in a composite magnetic resonance imaging signal comprising the steps of:
 - a) applying a series of steady-state free precession (balanced SSFP) pulse sequences, wherein evolution of the steady-state in each balanced SSFP pulse sequence follows a smooth exponential path,
 - b) measuring magnetic resonance signals during transient periods for the balanced SSFP sequences as steady-state signals evolve, and
 - c) fitting the transient response of the measured signals to a model to identify the smallest number of discrete exponential terms which provide a satisfactory representation of the measured data, which utilizes a curve-fitting algorithm.
2. (Canceled)
3. (Canceled)
4. (Currently Amended) The method as defined by claim 3 1 wherein the curve-fitting algorithm utilizes non-negative least-squares.
5. (Original) The method as defined by claim 4 wherein the model in step c) is defined by:

$$M(t) = \sum_{i=1}^N C_i e^{-\frac{t}{\tau_i}} + M_{ss}$$

where $M(t)$ is the signal intensity as a function of time,

N is the number τ points used in the fit,

C_i is relative amount of material with an exponential term constant τ_i ,

M_{ss} is steady-state signal in a voxel, and

τ is the exponential term in the fitting model.

6. (Original) The method as defined by claim 4 wherein a single data frame is acquired repeatedly over decay of the magnetic resonance signals.
7. (Original) The method as defined by claim 6 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.
8. (Original) The method as defined by claim 6 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.
9. (Original) The method as defined by claim 6 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.
10. (Original) The method as defined by claim 4 wherein multiple data frames are acquired repeatedly over decay of the magnetic resonance signals.
11. (Original) The method as defined by claim 10 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.
12. (Original) The method as defined by claim 10 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.
13. (Original) The method as defined by claim 10 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.
14. (Original) The method as defined by claim 4 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.
15. (Original) The method as defined by claim 4 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.

16. (Original) The method as defined by claim 4 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.

17. (Previously Presented) The method as defined by claim 1 wherein the model in step c) is defined by:

$$M(t) = \sum_{i=1}^N C_i e^{-\frac{t}{\tau_i}} + M_{ss}$$

where $M(t)$ is the signal intensity as a function of time,

N is the number τ points used in the fit,

C_i is relative amount of material with an exponential term constant τ_i ,

M_{ss} is steady-state signal in a voxel, and

τ is the exponential term in the fitting model.

18. (Original) The method as defined by claim 1 wherein before step a) a plurality of preparation pulses are applied, wherein an inversion pulse is applied with the preparation pulses and magnetization starts at a negative value.

19. (Original) The method as defined by claim 1 wherein before step a) a plurality of preparation pulses are applied and magnetization is saturated thereby.

20. (Original) The method as defined by claim 1 wherein before step a) a plurality of preparation pulses are applied and magnetization starts in a steady state and is inverted in the steady state.